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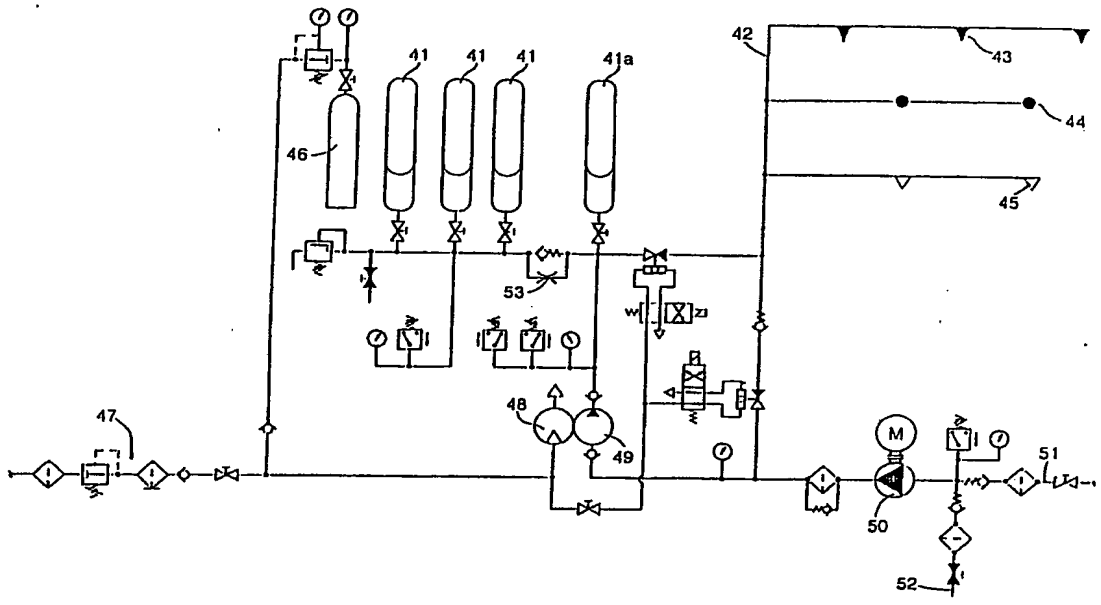

(57) Abstract

The object of the invention is to provide a new method and a new equipment for extinguishing fires especially in engine rooms and similar spaces. The fire is extinguished or at least pressed down by means of concentrated fog sprays with strong penetrating power, by utilizing high operating pressure, which is gradually decreased for the provision of spread fog-like liquid spraying. The extinguishing liquid is preferably delivered to spray heads (43, 44, 45) by using hydraulic accumulators (41, 41a).

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Method and equipment for fire fighting

The present invention relates to a method and an equipment for fire fighting, especially in engine rooms of ships and the like.

In spite of big amounts of water, prior art sprinkler installations have proved to be ineffective for extinguishing fires in engine rooms.

Prior art foam-extinguisher installations have also proved to be ineffective, because the foam cannot press down the fire sufficiently, but is destroyed by flue gases generated at the beginning of the fire.

The object of the invention is to provide a new method and a new equipment, capable of effective extinguishing of fires difficult to extinguish in engine rooms of ships and the like.

The invention is mainly characterized in that extinguishing liquid is sprayed via spray heads capable of producing concentrated fog sprays with a strong penetrating power under a high operating pressure and that an operating pressure is initially utilized which is high enough for producing said concentrated fog sprays in order to at least press down a fire broken out and that the operating pressure is reduced after that so that a spread fog-like liquid spraying is provided for effective heat absorption.

By means of fire fighting equipments, which are described e.g. in the Finnish Patent Applications 911028, 912434, 913059, 914704, 914823 and 915078 and which can operate at a high pressure and with small amounts of water and thereby cause an effective fog-like spraying of extinguishing liquid, it is possible to press down a fire in an engine room of a ship, for instance, with a small amount of water, e.g. 10 li-

tres water for a fire of 10 MW.

Such a small amount of water is, however, not capable of cooling down sufficiently the Diesel engine, boiler or another so-called risky part in which a fire usually breaks out, in order that no risk of reignition may remain.

The need of high pressure water is great during a short time of e.g. 10 seconds. Electric drive would lead to a disproportionate increase in load.

According to a preferred embodiment of the invention, accumulated energy is utilized in the form of pressure bottles, so-called hydraulic accumulators, in which nitrogen or air is suitably used as compression gas. In filling the accumulators, the gas is compressed, and therewith, water and pressure energy are accumulated. The charging pressure of the hydraulic accumulators is preferably about 250 to 300 bar and the amount of accumulated water about 200 l.

After the fire has been either extinguished or at least pressed down by means of concentrated fog sprays capable of penetrating the accumulation of hot air and hot flue gases generated above the fire seat, a need of cooling in general arises in the first place. The concentrated fog sprays imply in this connection a certain waste of the restricted amounts of water available. A more evenly spread fog-like liquid spraying results in an improved capability of absorbing heat. The flow resistance of the individual nozzles of the spray heads can preferably be adjusted in such a way that spread fog formation occurs when the pressure of the hydraulic accumulators has fallen to e.g. about 110 bar during discharge, whereby the initial counterpressure of the accumulators can be about 70 bar. The spread fog formation is also gentle to possible electric installations.

After the hydraulic accumulators have been emptied, which usually takes about 1 minute, the accumulators are recharged. During charging, liquid can be sprayed through the spray heads with the feed line pressure of e.g. 5 to 10 bar. If only the necessity of cooling remains for the prevention of reignition, the recharge of the accumulators can be interrupted at a pressure of e.g. about 110 bar, after which they are permitted to be emptied for spread fog formation. In combination with liquid spraying, also spraying of foam can be applied for the prevention of reignition, which will be described in greater detail later on.

In a preferred embodiment of the invention, each spray head comprises a liquid inlet, a central channel continuing from the inlet in a housing of the spray head, the channel leading to a centrally positioned nozzle, branchings extending from the central channel, the branchings leading to nozzles directed preferably obliquely to the sides, which nozzles are preferably arranged to operate with a high pressure generating fog sprays, and that in connection with the liquid inlet is positioned a valve body loaded by a spring so that the valve body at rest pressure in the liquid supply line closes the connection to the central channel of the spray head and that the valve body is driven, by a regular working pressure utilized for extinguishing, into the central channel against the spring and that the valve body is dimensioned in such a manner that in a flow slit between the valve body and the wall of the central channel occurs a pressure fall big enough to drive the valve body to the opposite end of the central channel, which valve body thereby closes the connection from the central channel to the centrally positioned nozzle.

Different preferred embodiments of the invention have been defined in greater detail in the claims presented later on.

In the following, the invention will be described more accurately with reference to exemplifying embodiments shown in the enclosed drawing.

Figure 1 shows an embodiment, which is suitable for fire fighting in relatively small spaces in the first place.

Figure 2 shows an alternative to the embodiment of Figure 1.

Figure 3 shows a diagram of connection of an equipment especially intended to be used for fire fighting in engine rooms of ships or similar spaces.

Figure 4 shows an alternative to the embodiment of Figure 3.

Figure 5 shows an alternative application of the embodiment according to Figure 4.

Figure 6 shows a spray head from the outlet side of the nozzles.

Figure 7 shows a longitudinal section of a spray head, in an inactive state.

Figure 8 shows a spray head at a first stage of an activated state similarly to Figure 7.

Figure 9 shows a second stage of the activated state in a corresponding manner.

Figures 10 and 11 show the extinguishing procedure of the embodiment of Figure 4 as a function of time and pressure.

In Figure 1, the reference numerals 1 and 1a indicate individual spray heads, of which the spray heads 1 can be located in ship cabins, while the spray heads 1a can be situated in a cabin corridor.

High pressure hydraulic accumulators, the number of which is four and which are connected in par-

allel, are indicated by 2, lines extending from the accumulators by 3 and branchings of these to the spray heads by 4. The lines 3 and 4 are preferably flexible fireproof hoses.

At the outlet of each accumulator 2 is preferably positioned a valve 5, which is, in rest position and with no spray head activated, arranged to maintain a relatively low pressure of e.g. 10 bar in the lines 3 and 4. If this pressure falls, i.e. some spray head begins to operate, the valve 5 is opened and full working pressure of about 100 to 200 bar enters the spray head in question.

The hydraulic accumulators 2 can comprise a liquid space 6 and a gas space 7 separated by a membrane 8. If the volume of the accumulator is 20 l, the initial pressure is 45 bar and the charging pressure about 200 bar, the accumulator is capable of delivering a liquid flow of about 14 l in about 1,3 minutes.

Instead of a gas space and membrane, the accumulators can also utilize as driving power a mixture of water and nitrogen or they can be of the piston type, possibly provided with a drive spring.

In Figure 2, the reference numeral 10 indicates four hydraulic accumulators connected in parallel, a common outlet line 11 of which leads to an automatic release valve 12, from which extend branchings to a number of spray heads 13. A motor-driven pump 14 is utilized for charging the hydraulic accumulators 10.

In Figure 3, the reference numeral 21 indicates a number of spray heads e.g. above a Diesel engine in an engine room, 22 indicates spray heads positioned by the engine, e.g. in the grates of floor, and 23 indicates spray heads in a floor plate above the bilge. The spray heads 21, 22 and 23 are preferably

of the type described e.g. in the Finnish Patent Applications 911028, 912434, 913059, 914704, 914823 and 915078 and capable of producing a water fog under a high working pressure. The spray heads 21 above the motor, which does not appear from the drawing, are directed downwards, while the spray heads 22 and 23 by the motor and in the floor plate, respectively, are preferably provided both with nozzles directed upwards and with nozzles directed downwards.

In front of the spray heads 21, 22 and 23 are positioned nonreturn valves 24 to maintain the pipe system 25 filled with water before starting extinguishing by means of the equipment.

Three first hydraulic accumulators for water are indicated by 26 and three second hydraulic accumulators for film forming foam with a foam content of e.g. 3 to 12 % are indicated by 27. The charging pressure of the accumulators 26 is e.g. 250 to 300 bar, and when the working pressure of the fire fighting equipment is supposed to be about 100 bar, the water accumulators 26 can have an effective working overpressure of about 140 bar and the foam accumulators 27 an effective working overpressure of about 70 bar, correspondingly.

Compressed-air driven liquid pumps indicated by 28, 29 and 30 are preferably used for charging the accumulators 26 and 27. These pumps are arranged to stop automatically when a set pressure has been achieved. To portion out foam concentrate in the right proportion, the pump 28 is provided with a bypass flow valve 31 as well as with a nonreturn valve 32 for portioning out a desired percentage of foam concentrate from a tank 33.

The system is charged as follows.

The pneumatic operating system, generally indi-

cated by 34, of the pumps 28, 29 and 30 is switched on, due to which the pumps 28, 29 and 30 start pumping. The left end of the pump 28 in the drawing pumps foam concentrate, the right end of the pump 28 in the drawing and the pumps 29 and 30 pump water. Because the pressure is lower in the accumulators 27 than in the accumulators 26, all pumps pump at first to the accumulators 27. The valve can e.g. be adjusted in such a way that as long as the pressure is lower than 140 bar (overpressure), the foam concentrate from the tank 33 is about 6 % of the pump combination.

When the pressure exceeds 140 bar, the water pumps 28, 29 and 30 charge all accumulators, but with still increasing pressure, a bigger and bigger part of the foam concentrate flows via the valve 31, through which the portioning out percentage is kept relatively constant. Valves 35 and 36 prevent the foam from going to the water accumulators 26. After the pressure has risen to a predetermined value, the pumps stop automatically.

The fire fighting procedure is described as follows.

When a fire breaks out within the sphere of influence of the spray heads 21, 22 and 23, a connecting valve 37 of the pipe system 25 is activated to the accumulator circuit and opens the connection to the pipe system 25. To prevent the charged energy from being wasted for filling the pipe system 25, the spray heads 21, 22 and 23 are provided with the non-return valve 24 preventing the pipe system 25 from being emptied.

During the first extinguishing stage, the water accumulators 26 dominate, the addition of foam is very little. The part of foam increases gradually when the pressure falls in the system, and to the

end, the percentage of foam has reached the predetermined value of e.g. about 6 %.

The method of extinction according to the invention, as described above, manages with a small amount of foam, which as such saves costs and is moreover environment friendly. As an example can be mentioned that about 500 l of foam concentrate are consumed in a corresponding prior art system with low pressure foam spraying, while the system of the invention copes with only 5 to 10 l foam. After the pressure has fallen enough as a result of the discharge of the accumulators 26 and 27, the valve 37 is closed and the pumps 28, 29 and 30 start automatically and begin to recharge the accumulators 26 and 27. At this point the fire is in most cases extinguished.

The equipment can, of course, serve several different Diesel engines, boilers, etc., which is indicated in the drawing by means of three valves on the left side of the valve 37.

To secure an even portioning out of foam concentrate, at least the pump 28 is preferably a twin pump for water and foam concentrate, due to which the pump for portioning stops also when the water pump stops; the pump for portioning out foam would otherwise be going all the time.

The reference numeral 38 indicates a water pipe extending to the pumps 28, 29 and 30.

A by-pass branching 39 provided with a nonreturn valve 40 extends from the pipe 38, which branching can be utilized for delivering liquid for continued cooling.

In Figure 4, four hydraulic accumulators connected in parallel are indicated by 41, 41a, their common outlet line by 42 and a number of spray heads by 43, 44 and 45, analogously with the spray heads

21, 22 and 23 of Figure 3. The hydraulic accumulators 41, 41a can have an initial pressure of about 70 bar and a volume of about 50 litres each. 46 indicates a pressure bottle, which can have a pressure of 200 bar and a volume of 20 litres and which, in case of disturbance in a compressed-air supply line 47, can be utilized for driving a pneumatic motor 48 driving a pump 49 for charging the accumulators 41, 41a.

A motor-driven pump 50 with a working pressure of e.g. 10 to 15 bar can be connected alternatively to a supply line 5 for fresh water, pressure about 5 bar, or to a line 52 for lake- or sea-water, pressure 5 to 10 bar. The pump 50 can be utilized for delivering water to the spray heads 43, 44 and 45, for cooling purposes in the first place, during the time the accumulators 41 are recharged after having been emptied.

At least somewhat before the discharge of the accumulators 41, 41a, the pump 50 is preferably arranged to spray low pressure water through the spray heads 43, 44 and 45 to cool these before switching on high operating pressure, through which the spray heads and their nozzles can better resist the mechanical stresses caused by a sudden switching on of fully charged accumulators. The pump 50 can preferably deliver liquid to the spray heads within a larger area immediately after a fire has been detected, until the fire has been located more closely.

A throttling 53 in combination with a nonreturn valve is connected between the hydraulic accumulator 41a and the other accumulators 41 in such a manner that the accumulator 41a is charged more quickly than the others and can be emptied again, if necessary, after a considerably shorter time than is possible if all accumulators are charged in parallel.

In Figure 5, the numeral 60 indicates a hydraulic accumulator, 61 indicates a pneumatic motor for driving a pump 62, working pressure e.g. 280 bar, for charging the accumulator 60. The numeral 63 indicates a preferably proportional pressure reducing valve (e.g. 7 bar), which is closed in a normal case, i.e. when the pressure air supply from a line 64 is undisturbed. The liquid supply of the pump 62 is indicated by 65 and the outlet line of the accumulator 60 by 66.

The initial pressure of the accumulator 60 can preferably be relatively high, e.g. about 150 bar. At interruptions in the regular pressure air supply 64, it is therefore possible to utilize the gas existing in the accumulator 60 for recharging the accumulator 60 via the valve 63 after emptying. This possibility of recharging the accumulator 60 is, of course, restricted by the fact that the initial pressure in the accumulator 60 will fall with a decreasing amount of gas, but it shall at least be possible to achieve a degree of charging which enables one repeated discharge or several repeated discharges with spread fog-like liquid spraying.

In Figures 6 to 9, the reference numeral 81 indicates generally a spray head, the body or housing of which is indicated by 82. Four nozzles directed obliquely downwards to the sides are indicated by 83, and a centrally positioned nozzle by 84. The nozzles 83 are intended to work at high pressure of e.g. 100 bar or more to cause a fog-like liquid spraying, preferably in mutual cooperation to form a common directional fog spray with high penetrating power. The construction and mutual arrangement of the nozzles 83 correspond preferably to what has been said in the Finnish Patent Applications 912434, 913059, 914704

and 915078.

The liquid inlet of the spray head 81 is indicated by 85, from the inlet 85 extends a central channel 86, which leads directly to the central nozzle 84 and from which extend channels 87 to the nozzles 83.

In the channel 86 is positioned a valve body 88, bearing against the inlet end of the channel 86 under the influence of a spring 89 and closing the connection 90 between the liquid inlet 85 and the channel 86, when the spray head is in an inactive state, Figure 7. For this purpose, the valve body 88 comprises e.g. a cone 61 to bear against a likewise conical sealing surface 92 of the housing 82.

After a fire has broken out, the fire fighting equipment is activated and there is a high pressure of e.g. 100 bar at the inlet 85. The high pressure surpasses the spring 89 and presses the valve body 88 apart from the surface 92, while liquid flows past the cone 91 via a split 93 between the base of the cone 91 and the wall of the channel 86. The split 93 is so narrow that the pressure fall in the split becomes great enough to surpass continuously the force of the spring 89, whereby the valve body 88 strikes right down to the bottom of the channel 86 and closes the connection from this to the central nozzle 84, preferably by means of a conical contact sealing like 91, 92; Figure 8.

If the extinguishing liquid is delivered by the hydraulic accumulators, the pressure in these falls gradually until the spring 89 is capable of pressing the valve body 88 apart from the position of Figure 8 to a position according to Figure 9, approximately in the middle portion of the channel 86, whereby the liquid flows past the valve body 88 to the central

nozzle 84 having a lower flow resistance than the nozzles 83. In the vast majority of cases, the fire is already extinguished at this stage by means of the fog sprays through the nozzles 83 during the first step of extinction, shown in Figure 7, and the continued liquid spraying through the central nozzle 84 serves in the first place for cooling in order to prevent a reignition. A continued spraying of liquid through the central nozzle 84, in the position of Figure 9, is possible, if necessary, by utilizing a conventional water pipe with a pressure of about 7 bar, even after the hydraulic accumulators have been emptied entirely and are possibly being recharged.

The nonreturn valves 24 drawn separately in Figure 3 are included in the spray heads in accordance with the Figures 6 to 9. The same function can be provided, however, by utilizing the principle shown in the Figures 6 to 9 for instance in such a way that a spray head with only a central nozzle and valve body and spring, but without side nozzles 83, is connected to a pipe portion between two so to speak common spray heads without valve body 88 and spring 89. At low or no pressure in the pipe portion, the connection is closed and it is opened when high pressure is switched on.

Before the valve body 88 of the spring 89 has been pressed loose from the position of Figure 8 to the position of Figure 9, concentrated fog sprays with strong penetration have at first been sprayed via the nozzles 83, and later, after the operating pressure has fallen, spread fog-like liquid has been sprayed.

Figures 10 and 11 show the extinction procedure of the embodiment according to Figure 4 as a function of time and pressure. The procedure is similar also

in the other embodiments.

In each figure, I, II, III, IV, V, ... indicate the first, second, third, fourth, fifth ... discharge of one or several hydraulic accumulator(s) 41, 41a.

A curve section 100 of Figure 10 includes both spraying of concentrated fog sprays and spread fog-like spraying. A curve section 101 refers to spread fog-like spraying with liquid supply directly from the pump 50 with a pressure of about 20 to 25 bar. A curve section 102 refers to a partial charge of at least the hydraulic accumulator 41a, a section 103 to repeated spread fog-like spraying, etc.

In Figure 11, the curve section refers to general spread fog-like spraying by means of the pump 50 until the fire seat has been located more closely, a section 111 corresponds to the section 100 in Figure 10, a section 112 corresponds to the section 101, a section 113 corresponds to the section 102 and a section 114 corresponds to the section 103 of Figure 10. The recharging sections 102 and 113 can naturally be varied according to need.

Claims:

1. A method for fire fighting, especially in engine rooms and similar spaces, c h a r a c - t e r i z e d in

that extinguishing liquid is sprayed via spray heads capable of producing concentrated fog sprays with a strong penetrating power under a high operating pressure and

that an operating pressure is initially utilized which is high enough for producing said concentrated fog sprays in order to at least press down a fire broken out and

that the operating pressure is reduced gradually so that a spread fog-like liquid spraying is provided for effective heat absorption.

2. A method according to claim 1, c h a r - a c t e r i z e d in that extinguishing liquid is delivered by using pressure charged energy.

3. A method according to claim 1 or 2, c h a r- a c t e r i z e d in that, before liquid spraying at high pressure, low pressure liquid is sprayed through the spray heads at least during a short time to cool the spray heads before switching on high operating pressure.

4. A fire fighting equipment, c h a r a c - t e r i z e d in that a drive unit of the equipment comprises at least one high pressure hydraulic accumulator (2; 10; 26, 27; 41).

5. A fire fighting equipment according to claim 4, c h a r a c t e r i z e d in that said at least one accumulator (2) is at its outlet provided with a valve (5) arranged to maintain a relatively low pressure at rest in an outlet line (3), with sprinklers (1) inactivated, and to connect the respective high

pressure hydraulic accumulator (2) with the operating pressure thereof, with a sprinkler (1) activated.

6. A fire fighting equipment according to claim 5, c h a r a c t e r i z e d in that said pressure at rest is about 5 to 20 bar and said operating pressure about 100 to 300 bar.

7. A fire fighting equipment according to claim 4, c h a r a c t e r i z e d in that the equipment comprises several high pressure hydraulic accumulators (2; 10; 26, 27; 41) connected in parallel.

8. A fire fighting equipment according to claim 4, especially in engine rooms of ships and similar spaces, c h a r a c t e r i z e d in

that the extinction is arranged to be carried out by means of spray heads (21, 22, 23) under high operating pressure, and

that the extinguishing medium is arranged to be delivered by utilizing pressure charged energy (26, 27) in such a way

that the fire is at first at least pressed down by means of liquid extinguishing, and

that the fire is eventually prevented from reigniting by means of foam spraying.

9. A fire fighting equipment according to claim 8, c h a r a c t e r i z e d in that the extinguishing medium is arranged to be delivered by two groups av hydraulic accumulators (26, 27), the first group (26) being arranged to deliver liquid, preferably water, the second group (27) being arranged to deliver a foam mixture of desired concentration and the second group (27) having a lower driving pressure than the first group (26).

10. A fire fighting equipment according to claim 8, c h a r a c t e r i z e d in that in connection with the spray heads (21, 22, 23) are ar-

ranged nonreturn valves (24) for securing that the supplying pipe system (25) is not emptied of liquid.

11. A fire fighting equipment according to any one of the claims 8 to 10, c h a r a c t e r i z e d in that the portion of foam is arranged to be increased gradually.

12. A fire fighting equipment according to claim 8, c h a r a c t e r i z e d in that the spray heads (21, 22, 23) are positioned on different levels, preferably above (21), on the side of (22) and below (23) each fire risk object, such as a Diesel engine.

13. A fire fighting equipment according to claim 12, c h a r a c t e r i z e d in that the spray heads (22, 23) positioned on the side and below, respectively, are arranged to spray both upwards and downwards.

14. A fire fighting equipment according to any one of the claims 8 to 13, c h a r a c t e r i z e d in that charging the accumulators (26, 27) with pressure energy is arranged by means of pneumatically driven pumps (28, 29, 30).

15. A fire fighting equipment according to claim 14, c h a r a c t e r i z e d in that at least one pump (28) is a twin pump with one part arranged to pump foam concentrate from a tank (33) and with the other part arranged to pump water.

16. A fire fighting equipment according to claim 15, c h a r a c t e r i z e d in that a bypass flow valve (31) in combination with a nonreturn valve is arranged to keep the amount of the foam concentrate pumped to each accumulator (27) at a predetermined portion.

17. A fire fighting equipment according to claim 8 and 14, c h a r a c t e r i z e d in that

the discharge for extinction is arranged to be activated by a pneumatically operated valve (37) by utilizing the same pneumatic system (34) which is used for the operation of the pumps (28, 29, 30).

18. A fire fighting equipment according to claim 17, c h a r a c t e r i z e d in that said activating valve (37) is arranged to be closed after the pressure of the accumulator circuit has fallen to a predetermined value and that the pneumatic system is thereby arranged to start automatically the operation of the pumps (28, 29, 30) for recharging the accumulators (26, 27).

19. A fire fighting equipment according to claim 7, c h a r a c t e r i z e d in that a charging pump (49) of the hydraulic accumulators (41, 41a) is driven by pressure gas (48).

20. A fire fighting equipment according to claim 19, c h a r a c t e r i z e d in that it comprises a separately connectable pressure gas holder (46) for emergency operation.

21. A fire fighting equipment according to claim 19, c h a r a c t e r i z e d in that the gas space in at least one hydraulic accumulator (60) is via a preferably proportional pressure reducing valve (63) connectable to the pressure gas drive unit (61) for emergency operation.

22. A fire fighting equipment according to claim 7, c h a r a c t e r i z e d in that at least one (41a) of the hydraulic accumulators is separated from the others (41) during charging via a throttling (57) for quick charging of said at least one accumulator (41).

23. A fire fighting equipment, c h a r a c t e r i z e d in that it comprises a spray head (81) with a liquid inlet (85), a central channel (86) con-

tinuing therefrom in a housing (82) of a spray head (81), the channel leading to a centrally positioned nozzle (84), branchings (87) extending from the central channel (86), the branchings leading to nozzles (83) directed preferably obliquely to the sides, the nozzles being preferably arranged to operate under high pressure generating fog sprays, and that in connection with the liquid inlet (85) is positioned a valve body (88) loaded by a spring (89) in such a way

that the valve body (88) under pressure at rest in the liquid supply line closes the connection to the central channel (86) of the spray head (81),

that the valve body (88) is driven, by regular operating pressure utilized for extinction, into the central channel (86) against the spring (89), and

that the valve body (88) is dimensioned in such a way that in a flow split (93) between the valve body (88) and the wall of the central channel (86) occurs a pressure fall big enough to drive the valve body (88) to the opposite end of the central channel (86) and thereby to close the connection from the central channel (86) to the centrally positioned nozzle (84).

24. A fire fighting equipment according to claim 23, c h a r a c t e r i z e d in that the centrally positioned nozzle (84) has a lesser flow resistance than the side nozzles (83).

25. A fire fighting equipment according to claim 23, c h a r a c t e r i z e d in that the valve body (88) is at pressure at rest arranged to close the connection (90) from the liquid inlet (85) to the central channel (86) on the channel (86) side.

26. A fire fighting equipment according to claim 25, c h a r a c t e r i z e d in that the valve body (88) comprises a cone (91) facing the li-

quid inlet for cooperation with a corresponding conical sealing surface (92).

27. A fire fighting equipment according to claim 25, c h a r a c t e r i z e d in that the force of the spring (89) loading the valve body (88) is adjusted to open the connection from the central channel (96) to the central nozzle (84) at a pressure somewhat higher than regular water pipe pressure, such as about 7 bar.

28. A fire fighting equipment according to claim 27, c h a r a c t e r i z e d in that the force of the spring (89) is adapted not to close the connection (90) between the liquid inlet (85) and the central channel (86) at regular water pipe pressure.

29. A fire fighting equipment according to claim 8 or 19, c h a r a c t e r i z e d in that in case of a fire alarm a pump (50) is arranged to deliver immediately low pressure liquid of e.g. 20 to 25 bar to provide spread fog-like spraying preferably over a major area, until the fire seat has been located exactly.

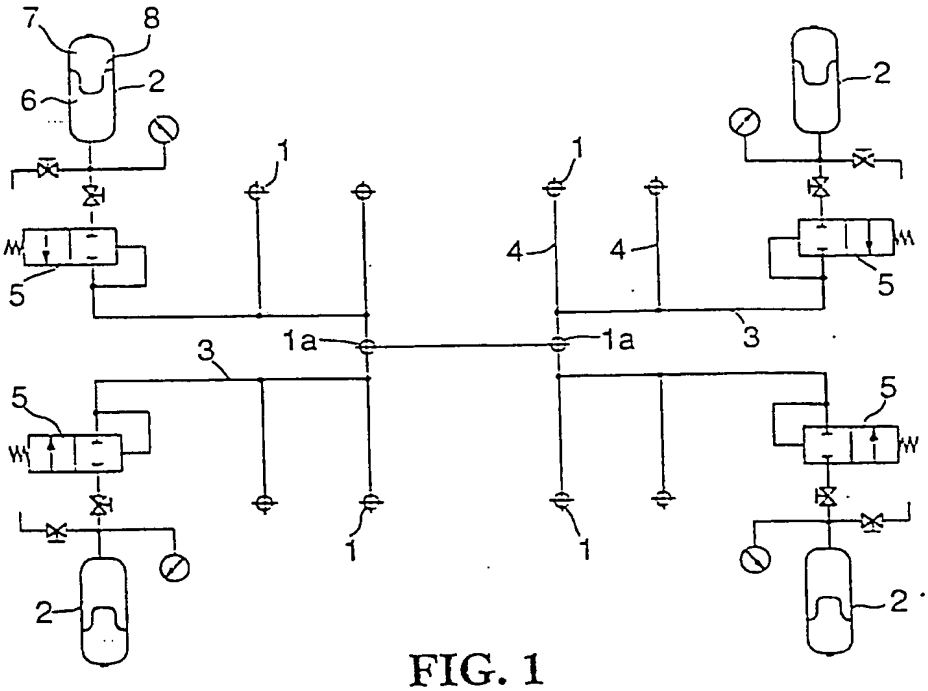


FIG. 1

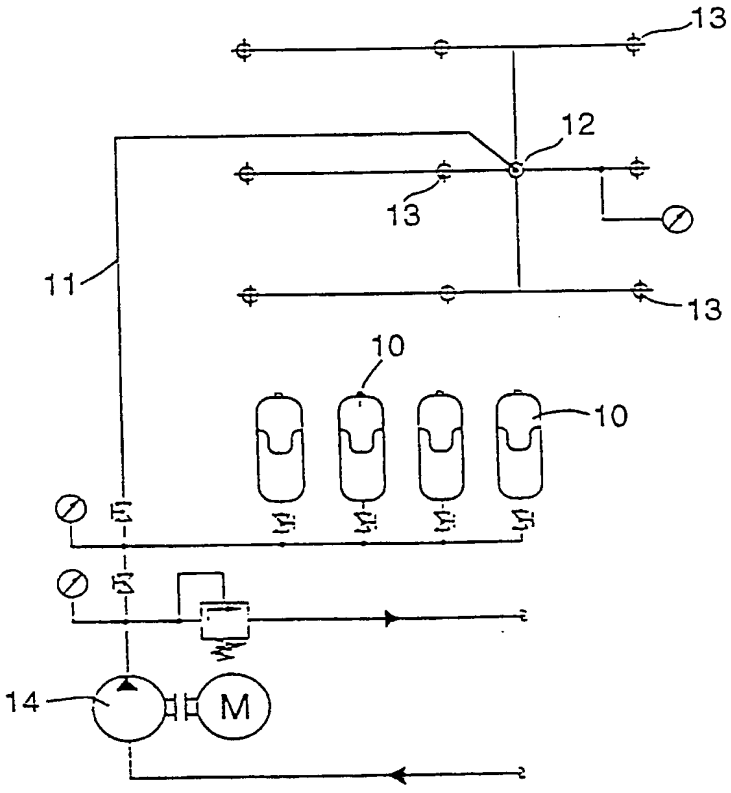


FIG. 2

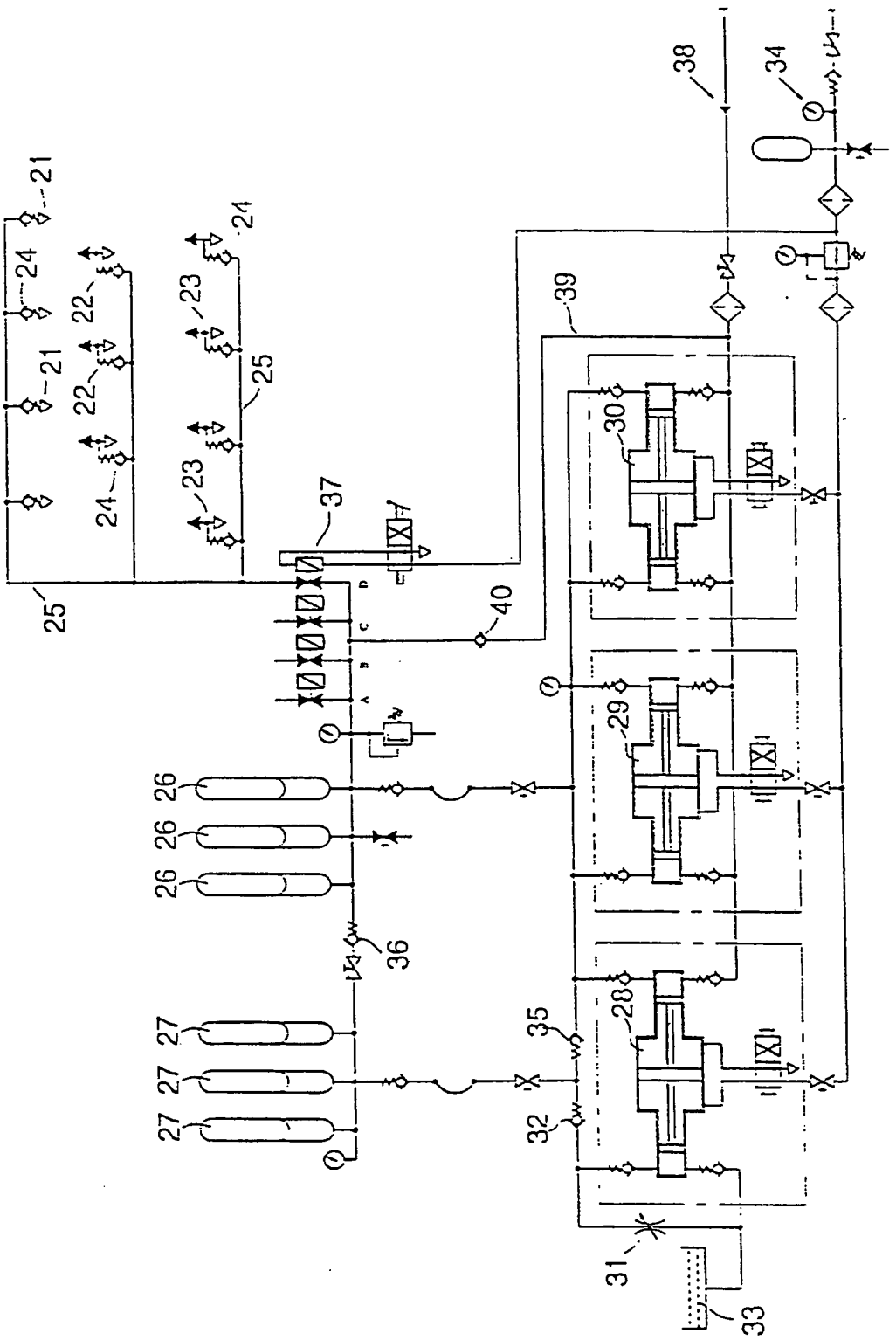


FIG. 3

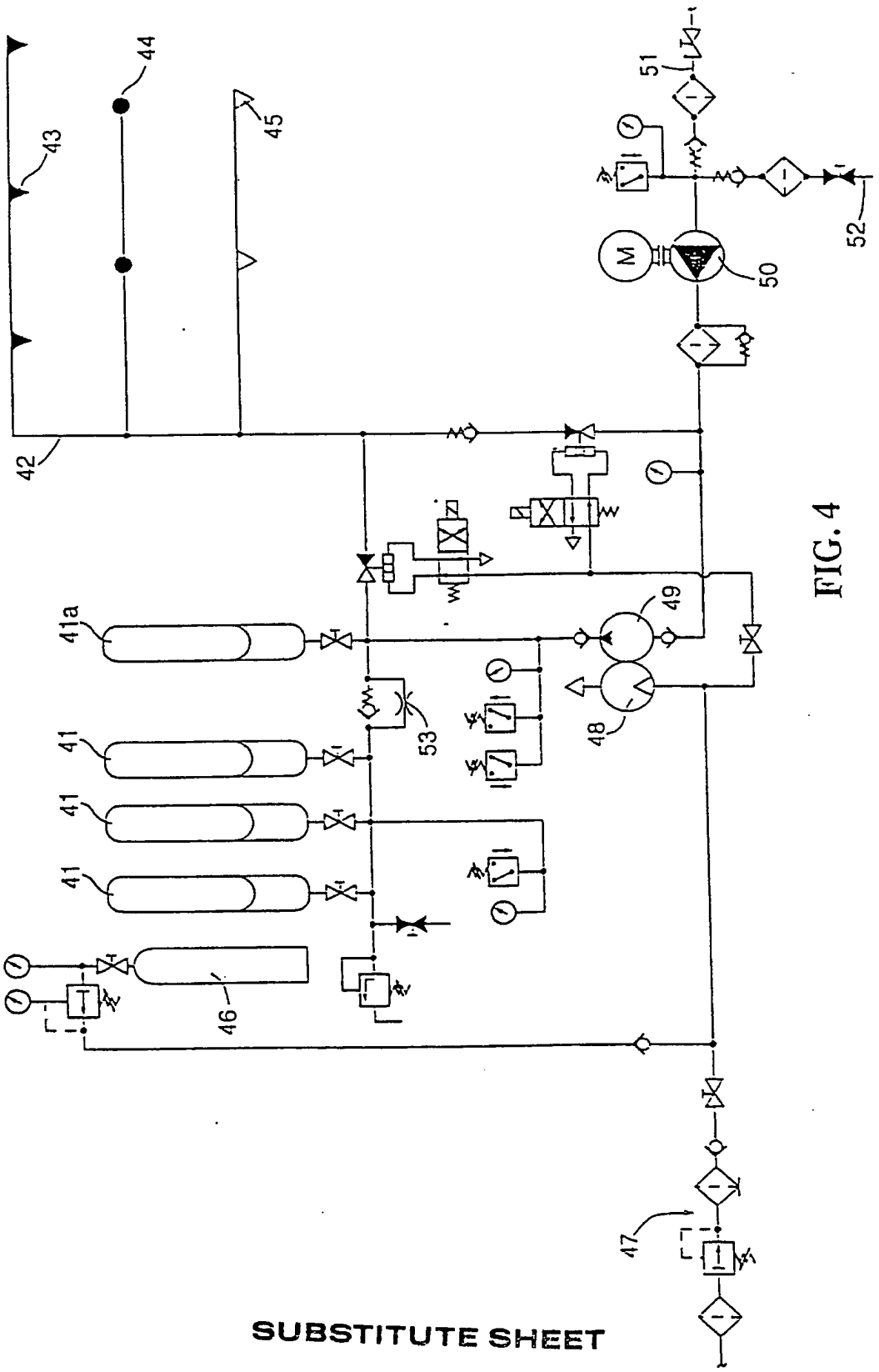


FIG. 4

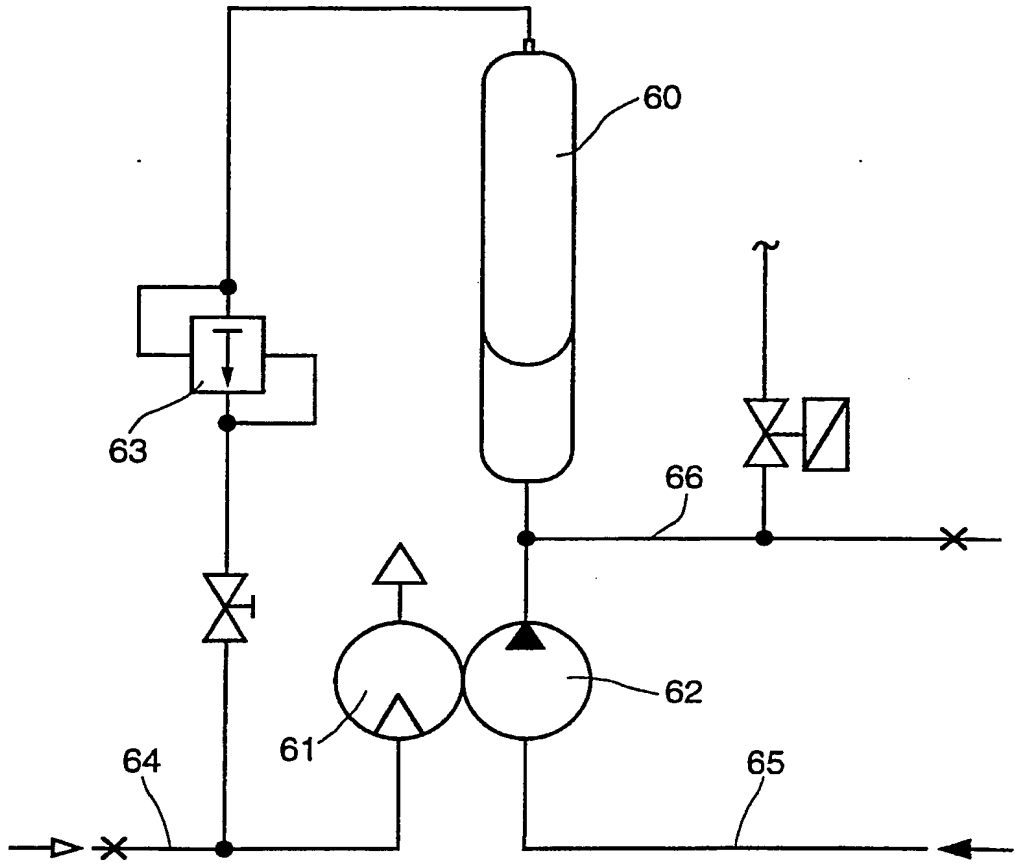


FIG. 5

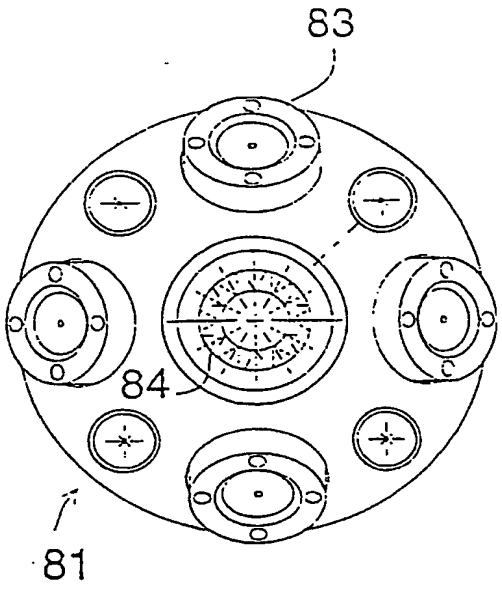


FIG.6

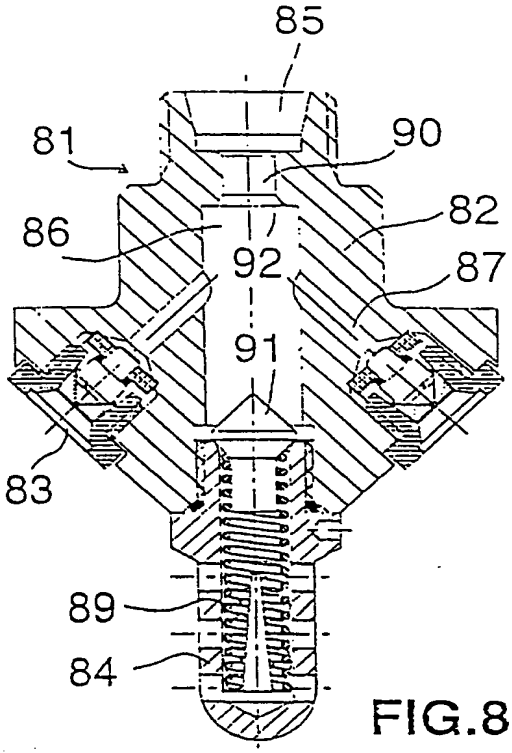


FIG.8

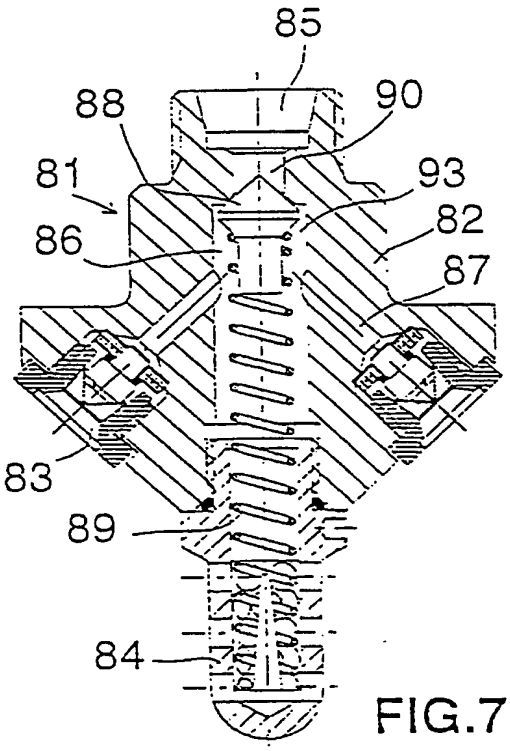


FIG.7

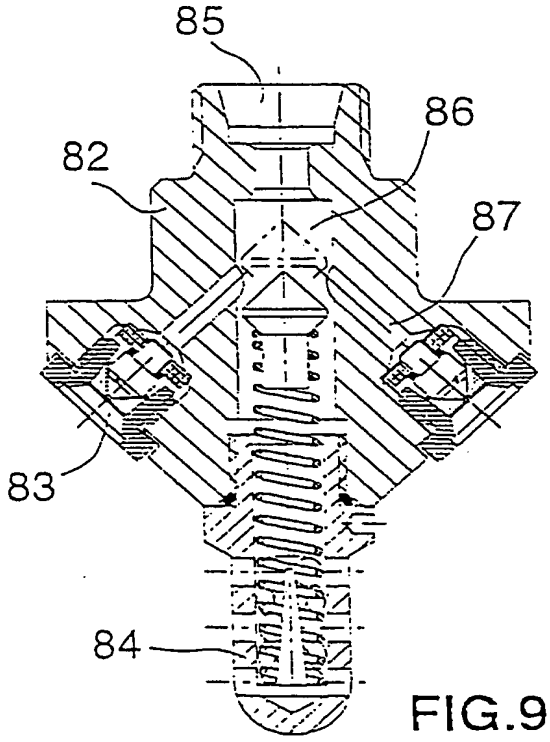
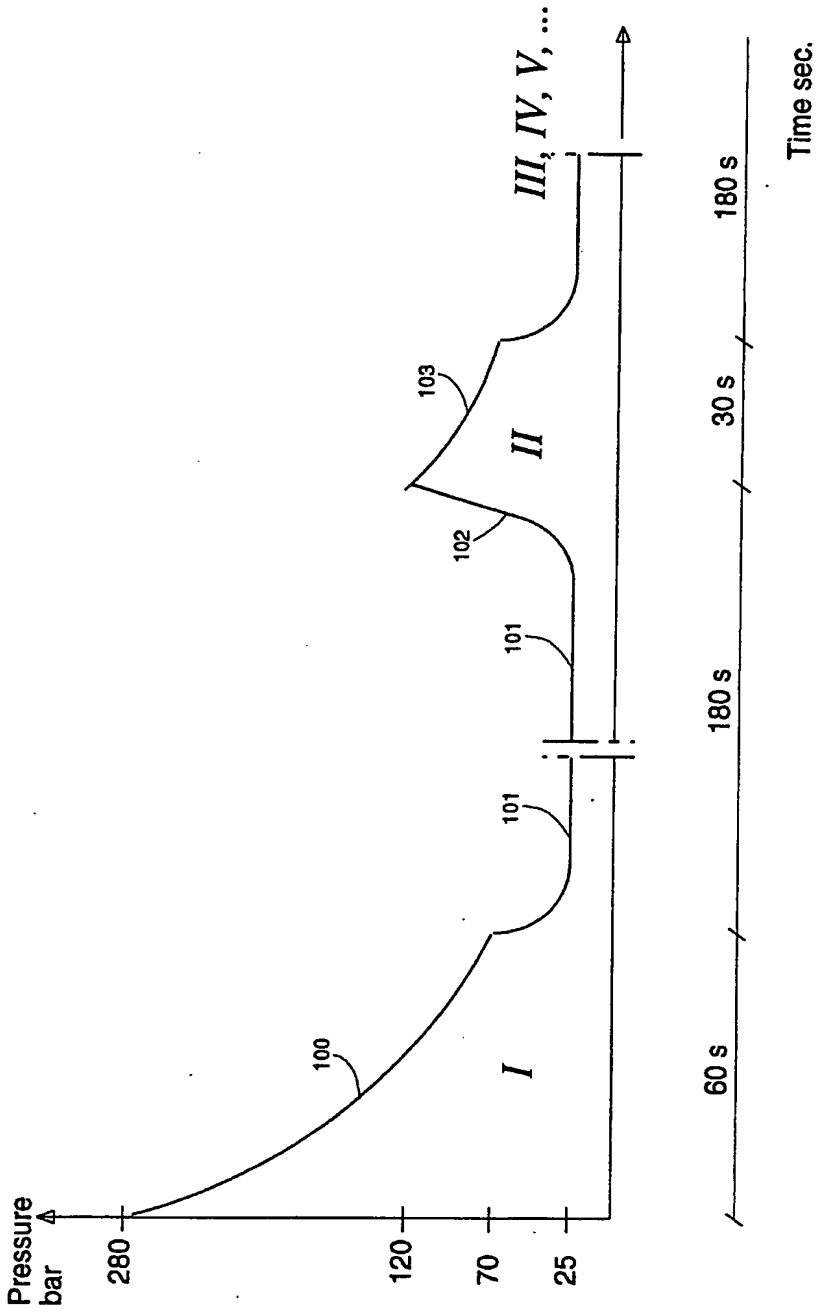


FIG.9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bar
280
120
70
25
100
101
101
I
II
III, IV, V, ...
102
103
60 s
180 s
180 s
30 s
180 s
Time sec.

FIG. 10

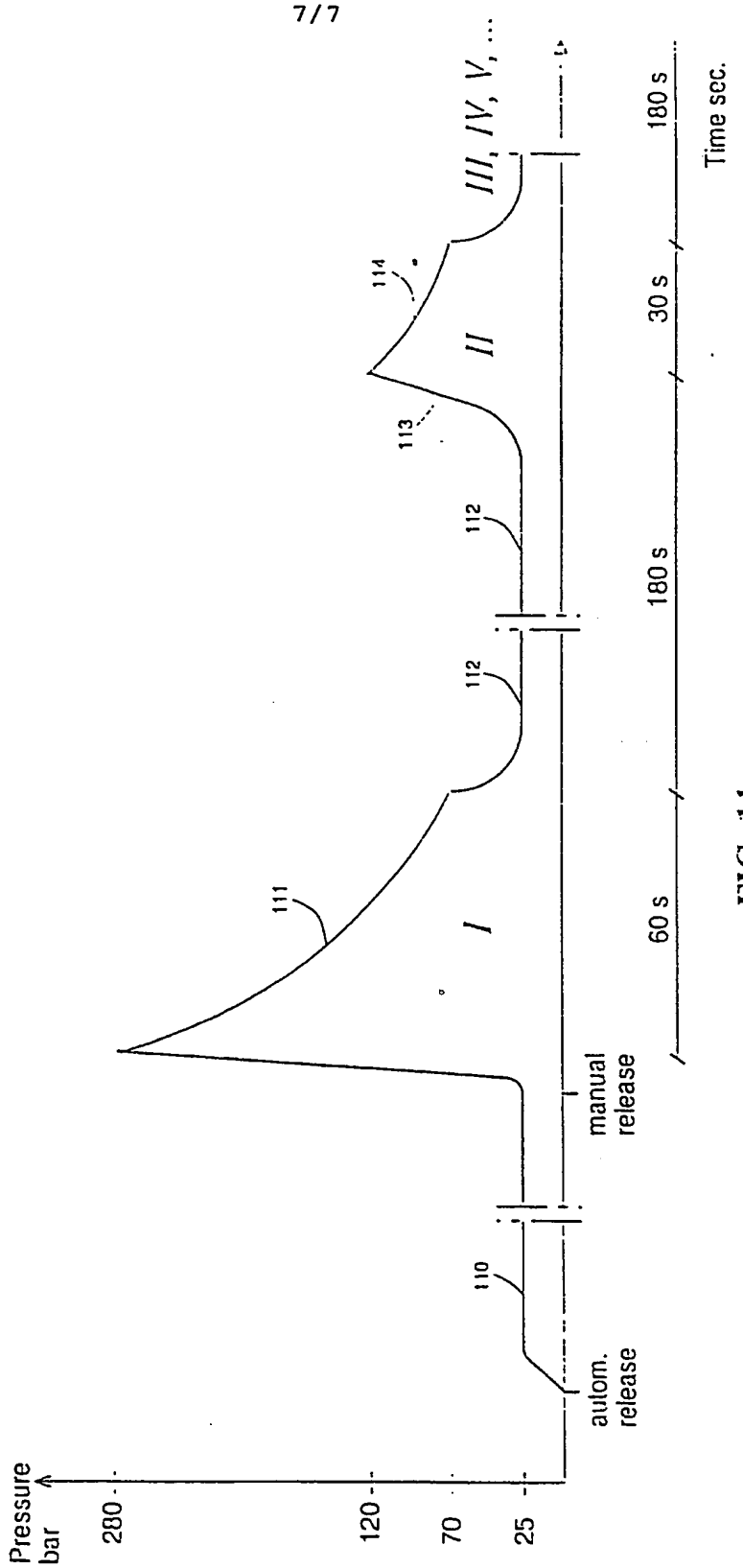
Pressure
bar
280
120
70
25
autom.
release
manual
release
110
111
112
112
113
114
I
II
III, IV, V, ...
60 s
180 s
30 s
180 s
Time sec.

FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 92/00193

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 62 C 35/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	A 62 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	US, A, 3684019 (EMMONS ET AL) 15 August 1972, see column 4, line 20 - line 36; figure 2 --	1
A	DE, C2, 3825078 (HARDT, HANS-JOACHIM) 18 April 1991, see column 4, line 44 - line 49; claim 8 --	1
A	Derwent's abstract, No. 83-763 236/37, SU 971 365, publ. week 8337 (KLIMENKO A S) --	1
A	WO, A2, 9107208 (KIDDEGRAVINER LIMITED) 30 May 1991, see the whole document --	4

* Special categories of cited documents:[10]

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1st October 1992	02 -10- 1992
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Ulrika Öhman Ulrika Öhman

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	EP, A1, 0129629 (SMAC ACIEROID) 2 January 1985, see page 3, line 14 - line 23 --	4

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/FI 92/00193

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 28/08/92
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3684019	72-08-15	NONE	
DE-C2- 3825078	91-04-18	NONE	
WO-A2- 9107208	91-05-30	NONE	
EP-A1- 0129629	85-01-02	NONE	